Contour Interval 500 feet unless noted

Base From U.S. Geological Survey Cold Bay and Port Moller, Alaska Quadrangles, scale 1:250,000.

Population data from Aleutians East Borough, 1995

U.S. GEOLOGICAL SURVEY Area likely to be affected by lahars, floods, and lava flows from large eruptions. Lava flows would probably not STROMBOLIAN ERUPTIONS AT PAVLOF VOLCANO Bering AND HAZARDS FROM VOLCANIC ASH CLOUDS extend beyond the volcano slopes. Pavlof Volcano and its satellite vents, Pavlof's Sister and Little Pavlof, are near the western tip of the Alaska Peninsula, about 950 km Area likely to be affected by small lahars not confined to Sea southwest of Anchorage, Alaska. Pavlof has been one of the most active volcanoes in the Aleutian volcanic arc, with more than 30 channels on the upper part of the volcano. known periods of volcanic activity since the mid-1700's. Both Pavlof's Sister and Little Pavlof are Holocene in age, but neither are Sediment-laden known to have erupted in historic time. This preliminary hazard assessment does not include these volcanoes. water flows are expected along the Area likely to be affected by lahars, floods, and lava flows Cathedral River Pavlof Volcano has a strombolian eruptive style. Strombolian eruptive activity consists of a series of explosions at the surface of a during all types of magma column caused by the rapid expansion of magmatic gasses. These discrete explosions generally last a few seconds or less and from small eruptions. Lava flows would probably not eruptions. These may be rhythmic or intermittent. The explosive bursts are often distinctly audible as a rumbling or thunder-like noise. flows may overtop extend beyond the volcano slopes. stream banks and could be hazardous Strombolian explosions usually eject fragments of hot, glowing spatter to heights of tens to hundreds of meters above the vent. Typical to people fishing or exit velocities are about 100 meters per second. At night, these glowing fragments trace parabolic paths as they fall back into the vent boating on the Approximate extent of spatter-fed debris apron and area or onto the volcano's flanks. Occasionally, the explosions can be so closely spaced in time that the glowing ejecta forms spectacular river. rooster-tail shaped lava fountains extending 100 meters or more above the vent. likely to be affected by ballistic showers. In a typical strombolian eruption, the volume of erupted material is usually small (0.01 to 0.1 cubic kilometers of magma) and the eruption column may reach only a few hundred meters above the vent. Usually, a sustained eruption column does not develop and pyroclastic debris aprons. Note the small "puff-like" ash plume which is Area that could be affected by pyroclastic flows. relatively little volcanic ash (tephra) is erupted (unlike the more vigorous eruptions of Redoubt and Mount Spurr Volcanoes). During typical of strombolian eruptions. Photograph courtesy of Aeromap, many Pavlof eruptions, a series of brownish pulses of dusty tephra climb to heights of a few hundred meters above the vent before U.S. being rapidly dispersed by the wind. During vigorous Pavlof explosions, these pulses of tephra reach heights of 5 to 7 kilometers 1986-88 lahars above the vent. Volcanic ash could extend as high as 11 kilometers above the vent during extreme, but rare eruptions. 1996-97 lava flows MAJOR CITIES HAZARDS FROM AIRBORNE ASH AVERAGE WIND DIRECTION (s=summer w=winter) AND ASH FALLOUT Seismic station Although emissions of volcanic ash from Pavlof are generally not voluminous, communities near the volcano can receive frequent light dustings of fine ash. The amount of ash carried by the wind will depend on wind speed and direction. Most ash clouds consist of sandsized and smaller ash particles, steam, and other gasses. An ash-laden plume is typically dark colored, whereas plumes composed mostly of water vapor and volcanic gas (generally present in non-toxic concentrations) tend to be light colored. Aircraft flying near the volcano could be affected by even small amounts of tephra and all PROXIMITY of visible tephra plumes should be avoided. Because tephra bursts may + 55° 30' ORTH PACIFIC AN extend 5 to 7 kilometers above the volcano there is a substantial hazard SIAN FAR EAST / to all aircraft especially at night when it would be difficult to detect a ROUTES Night view of strombolian eruption at Pavlof Volcano, The upper photo shows pulses of dusty volcanic ash erupted during rhythmic ACTIVE VOLCANOES explosions in 1986. The lower photo shows a steam and ash plume produced during eptember 29, 1996. Strombolian activity at the 55° 30' N + Tephra fallout from Pavlof Volcano may be a nuisance to people and Jet aircraft traveling the North Pacific and Russian Far East air routes southern vent (right) feeds a lava flow. Mild 162° 20' W a sustained explosion in 1986. may damage water supplies, machinery and electronic equipment. pass over or come close to numerous active volcanoes including strombolian activity is occurring at the northern vent Pavlof. During eruptions, clouds of volcanic ash often occupy the (left). Although unlikely, heavy tephra fall could collapse buildings. airspace used by these aircraft. Many thousands of people per day and a vast amount of air cargo are transported via these air routes. HAZARDS IN THE IMMEDIATE Holocene volcano HAZARDS FROM AIRBORNE ASH AND ASH FALLOUT Nelson Lagoon (eruptions in the last 10,000 years) VICINITY OF THE VOLCANO WINDS ALOFT, COLD BAY Pleistocene volcano Significant hazards near Pavlof Volcano are volcanic debris flows (lahars), pyroclastic (eruptions in the last 1.8 million to flows, lava flows, ballistic showers, and slope failures. Flooding and lahars may occur along the Cathedral River. Average wind direction and frequency. Lahars are rapidly moving, slurry-like flows of volcanic rock debris, mud, and water. Because Pavlof Volcano is snow Improved runway or landing Wind rose length is proportional to covered most of the year, lahars may form whenever sufficient hot material encounters snow or ice. If enough snow and ice annual wind frequency. The most frequent is melted, lahars could extend down the Cathedral River to the coast and deliver several meters of sediment to bottom land winds blow toward the east and northeast HISTORICAL VOLCANIC ACTIVITY areas. If lesser amounts of sediment are entrained by the lahar, or if sediment is deposited by the lahar downstream from the and thus ash fall would be most likely in volcano, it will continue moving, but will behave more like a typical water flood. Lahars and floods are hazardous to AT PAVLOF VOLCANO areas east and northeast of Pavlof Volcano. humans, would destroy structures and property in their path, if such structures existed, and would temporarily affect water 1929-1931 quality and aquatic habitat. Areas within about 2-5 kilometers of 1936-1948 Pyroclastic flows are hot, fast-moving clouds of volcanic rock debris that can form when partially solidified accumulations of lava collapse from the 1950-1953 Pavlof Volcano could receive thick Approximate area of hazard map in vent area or when a rising eruption column collapses and descends the volcano flanks. Although rare at Pavlof Volcano, a small pyroclastic flow was ash fall during a large eruption. 1960-1963 observed during the 1986 eruption that swept down the east flank of the volcano a few kilometers beyond the vent. Persons within 5 kilometers of the Areas more than about 2-5 kilometers from the volcano vent or on the flanks of the volcano are at risk from pyroclastic flows. would receive only a light 6,000 dusting of ash. Lava flows at Pavlof Volcano usually form by the accumulation of molten spatter around the Lahars and flooding eruption column could affect the southvent or by direct overflow. Eventually, these spatter-fed flows coalesce to form narrow, ribboneast side of the volcano. like flows that extend a few kilometers from the vent and often occupy deep gullies and narrow (debris avalanche) These flows would most canyons on the volcano flanks. Although as hot as 1100 °C, the flows themselves are not Approximate extent likely be thin and slowof Izembek National particularly hazardous unless encountered at close range (a few meters or so). The lava flows at 1986-1988 pyroclastic flow moving. However, life Wildlife Refuge Pavlof cause melting of ice and snow and may initiate downstream lahars and flooding. 1996-97 dome collapse and property may be at Paylof Sister PAVLOF Little VOLCANO Ballistics are partially solidified masses of lava a few centimeters to several tens of meters in lahar (debris flow diameter that are ejected and land near the vent. These particles or bombs usually follow a lava flow parabolic trajectory and leave the vent at speeds of 100 meters per second or more but rarely Pavlof reach heights of more than a few hundred meters above the vent. The bombs may roll down Mt. Emmons steep slopes. Ballistic showers are hazardous to people who are very close to the volcano, especially the active vent. When viewed at night, ballistic showers can be spectacular. BaySmall-scale slope failures at Pavlof Volcano may occur near the vent as spatter accumulates, Volcanoes generate a wide eventually becoming unstable, and collapsing in small avalanches. Spatter-fed pyroclastic debris variety of phenomena that can alter aprons may form along the volcano's flanks by this process. Large-scale slope failures leading the Earth's surface and atmosphere to a major debris avalanche apparently have not occurred at Pavlof Volcano. and endanger people and property. While most of the natural hazards illustrated and described in this

PRELIMINARY VOLCANO-HAZARD ASSESSMENT FOR PAVLOF VOLCANO, ALASKA

0 5 10 15 20 25 Kilometers

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of AVO are the U.S. Geological Survey, the University of Alaska-Fairbanks Geophysical Institute, and

the Alaska Division of Geological and Geophysical Surveys. During summer 1996, six seismic

monitoring stations were installed on Pavlof Volcano, as part of a larger initiative to expand the volcano

monitoring and eruption response network supported by AVO. Funding for this initiative came from the

Federal Aviation Administration with additional support from the U.S. Geological Survey and the State

diagram are associated with eruptions, some, like landslides, can

occur even when a volcano is quiet.

Small events may pose a hazard only within a few miles of a volcano, while large events can directly or indirectly endanger people and

property tens to hundreds of miles

Modified from Meyers and Brantley, 1995, USGS Open-File Report 95-231

Simplified sketch of a

hazardous phenomena.

stratovolcano and associated

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